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BEFORE THE
POSTAL REGULATORY COMMISSION
WASHINGTON, D.C. 20268–0001

PERIODIC REPORTING (PROPOSAL TWO)	Docket No. RM2018-5

PETITION OF THE UNITED STATES POSTAL SERVICE FOR THE INITIATION OF A PROCEEDING TO CONSIDER PROPOSED CHANGES IN ANALYTICAL PRINCIPLES (PROPOSAL TWO)

(May 25, 2018)

Pursuant to 39 C.F.R. § 3050.11, the Postal Service requests that the Commission initiate a rulemaking proceeding to consider a proposal to change analytical principles relating to the Postal Service's periodic reports. The proposal, relating to new sampling procedures for the city carrier portion of the In-Office Cost System (IOCS), is labeled Proposal Two and is discussed in detail in the attached text.

Respectfully submitted,

UNITED STATES POSTAL SERVICE

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PROPOSAL TWO

Proposal to Change the In-Office Cost System for City Carriers

Objective

The Postal Service proposes a change in the In-Office Cost System (IOCS) methodology for sampling city carriers. Census data from the Time and Attendance Collection System (TACS) and Delivery Operations Information System (DOIS) that are now available enable a new cluster sampling approach that allows data collectors to take on-site readings in the morning while carriers are on the premises and handling mail. The new design improves data quality by obtaining far more data from on-site rather than telephone readings, while simultaneously improving data collection efficiency.

Background

The current IOCS sampling design uses a multi-stage probability sample to randomly select craft employees, including city carriers, then an interval of work time from the employee's tour, ultimately resulting in an observation that represents a "snapshot" of the work activities in a sampled interval. A result of that design is that readings are widely dispersed, both in time and in space. It is costly to have data collectors travel to do just one IOCS reading out at a distant delivery unit, so most carrier readings are conducted by telephone. In FY2017, there were over 250,000 individual readings scheduled on city carriers, and over 85 percent of those were telephone readings.

The availability of detailed clock ring data from the Time and Attendance Collection System (TACS) affords the opportunity to reshape the sampling design significantly in order to improve sampling efficiency and data quality. The Commission recently approved the use of TACS data in Proposal Five, Docket No. RM2017-9 to determine the total city carrier costs for letter routes and for Special Purpose Routes (SPR).[1] This proposal extends the use of TACS data to weight sampling data by zone, and to provide cost controls for city carriers by time of day (morning from afternoon), and day of week group (Sunday/Holiday from weekday/Saturday). This enables the replacement of telephone readings in the current system with onsite data collectors conducting readings within individual zones using a cluster sampling design.

This proposed redesign of IOCS is similar in some respects to earlier Proposal Three in Docket No. RM2016-11 that was withdrawn by the Postal Service.[2] The new proposal, however, differs from the previous Proposal Three in several key ways. These include:

- Rather than define office and street time by using TACS clockrings, as proposed in Proposal Nine that the Commission rejected in another related docket (Docket No. RM2015-2), the extant proposal would continue to use the current definition of office (on the premises of the facility, including the parking area) and street

[1] Order No. 4399, February 6, 2018.
[2] Order No. 3559, October 7, 2016.

(off the facility premises). Proposal Nine was ultimately denied, which precipitated the withdrawal of Proposal Three.[3]

- In morning tests, data collectors would take readings up to 11am, rather than ending the test after all carriers have clocked out of the office.
- Data collectors would take readings on carriers that are working in the parking area, not just inside the facility.
- In morning tests, data collectors would take readings at fixed time intervals, rather than taking readings as quickly as possible and weighting those using granular TACS data by time bin.
- In morning tests, a maximum of six carriers would be subsampled to represent the zone, rather than all carriers.

The primary benefit of this proposal is that data collectors would be on-site to conduct readings for the vast majority of the time that carriers are on the premises handling mail.[4] This enables the scanning of barcodes, which can help improve data quality. On-site data collectors can also be a benefit in cases of rare or unusual markings with which telephone respondents may not be familiar. Furthermore, the data collectors' primary duty is to record data, without the distractions that may impinge on telephone respondents' time.

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[3] Order No. 3526, September 22, 2016.

[4] Traditionally, IOCS has referred to the time while carriers are on the premises, including loading the vehicle while in the parking area, as "in-office". However, because Operations generally uses "in-office" to refer to the time before loading the vehicle, this proposal generally uses "on-premises" to improve clarity.

Proposal

The Postal Service proposes to change the IOCS system design for city carriers to a cluster sampling approach that uses census data from TACS to weight sampling data.

The key elements of Proposal Two are that, if approved, the Postal Service would:

- In the morning when carriers are working on the premises, use clustered on-site readings in sampled delivery zones[5].
    - For zones with six or more routes, use stand-alone IOCS-Cluster tests (Sampling Mode 1 described below).
    - For zones with five or fewer routes, use IOCS-Cluster tests synchronized with City Carrier Cost System (CCCS) tests (Sampling Mode 2).
    - Use DOIS and TACS data for the sampled zone to weight the readings for each test relative to other tests within the same CAG strata, and to post-stratify readings by route group (letter routes; Special Purpose routes), and craft group (full-time; part-time / transitional).
- In the afternoon, cluster readings together into one-hour intervals and conduct all readings by telephone (Sampling Mode 3).
- Use TACS data to provide control totals for the portion of supervisor costs incurred by employees whose base craft is carrier, but who have clocked as supervisor.

[5] Zone is defined by both ZIP Code and finance number.

- Conduct no tests on Sundays and Holidays. Rather, develop control total costs for Sunday/Holiday from TACS hours, and distribute costs using scanning data from Product Tracking and Reporting (PTR).[6]

A full description is provided in Appendix A, "In-Office Cost System: IOCS-Cluster Statistical Documentation," attached at the end of this document. A brief description is provided here.

Sampling Modes

Sampling Mode 1: Morning tests clustered by zone / On-site / Stand-alone

Mode 1 is the primary sampling mode of the proposed IOCS-Cluster subsystem, used for on-site sampling of zones with six or more routes. Zones are selected randomly in proportion to their size, measured as their number of DOIS city carrier hours. Data collectors conduct on-site readings on the cluster of carriers assigned to the selected delivery zone on the selected day. The data collectors identify all carriers working in the selected zone, and use the data collection software to randomly subsample six carriers from the list. Data collectors conduct readings every five minutes, therefore conducting a reading on each of the six selected carriers once every 30 minutes. These include readings conducted while the carrier is in the parking area or

[6] Pending possible further study, the Postal Service intends to file a separate proposal outlining the use of PTR data for Sunday/Holiday costs.

on the loading dock. Readings begin when carriers start their workday and they are conducted until 11am.[7]

Sampling Mode 2: Morning tests clustered by zone / On-site / Synchronized with CCCS

The primary sampling mode of on-site stand-alone tests, Mode 1, is suitable when there are at least six city carriers working the selected zone, sufficient to justify sending a data collector to conduct on-site readings. For zones with fewer than six carriers, the Postal Service proposes a second sampling mode in the morning, synchronizing IOCS-Cluster tests with City Carrier Cost System (CCCS) tests when a data collector is already scheduled to be on-site at a delivery unit. Data collectors include all carriers working the selected zone and they conduct one reading every 15 minutes. The frequency of readings is reduced because the data collector must also conduct their CCCS test. In other respects, sampling mode 2 is similar to mode 1.

Sampling Mode 3: Afternoon tests clustered by hour / Telephone

This sampling mode would be used to collect data between 11:00 and 19:00, after the on-site tests are completed. [8] Carriers are on the street over 95 percent of this time, so there are too few carriers in the office to justify sending data collectors to conduct on-site tests. IOCS-Cluster telephone tests are scheduled for one-hour blocks

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[7] If all carriers have left for the street and the supervisor confirms that none will return before 11am, the data collector may record street readings for all carriers up to 11am and end the test early.

[8] Through quarter 2 of FY2018, the end time for such afternoon cluster tests was 18:00, but that was extended to 19:00 beginning in quarter 3 of FY2018.

of time. The data collection software randomly selects 30 carriers from IOCS panel offices across the district, and then groups these 30 by finance number.[9] The data collector calls each office and conducts a reading on all selected carriers at each office. If the data collector cannot reach a supervisor or respondent in a reasonable amount of time, the data collector records stop readings for all the carriers in that office and continues on to contact the next office in the sequence.

Estimation of Costs for Carriers

The Postal Service proposes to estimate costs using DOIS data to weight the IOCS-Cluster sample readings. Data from each IOCS-Cluster morning test are scaled to reflect the corresponding DOIS workhours for the tested zone. Pursuant to Order No. 4399, separate cost control totals are developed for letter routes and Special Purpose Routes (SPR) using TACS hours by Labor Distribution Code (LDC), together with accrued labor costs, by craft group (full-time, part-time/transitional) and CAG.

For the afternoon, sampling data from all afternoon tests are scaled to the total hours in the afternoon. These are not estimated by CAG separately because there are insufficient afternoon tallies, but no significant difference is expected because carriers from all CAGs are overwhelmingly on the street and not on the premises handling mail.

Additional detail is provided in Appendix A.

[9] Grouping of carrier readings by finance number became effective in the software used in FY18Q1. During FY17Q4, individual carrier readings were sequenced randomly and not grouped by office, and there was no limit on the number of readings.

Sample sizes

Table 1 displays the proposed numbers of tests by each sampling mode, and the projected number of non-stop readings that are expected from each mode.[10]

Table 1: Proposed Sample Sizes and Projected Number of Non-Stop Readings

Sampling Mode	Proposed number of tests per year	Projected number of non-stop readings per test*	Projected number of non-stop readings per year
AM On-site, stand-alone	4,000	36	144,000
AM On-site, synchronized with CCCS	1,000	12	12,000
PM Telephone	1,000	11	11,000
Total	6,000		167,000

*From FY2017 Q4 and FY2018 Q1 data.

Based on the pilot, about 70,000 of these 167,000 will be readings that are conducted while the carrier is on premises. By comparison, the current IOCS obtains fewer than 35,000 on-premises carrier readings annually out of more than 250,000 scheduled. IOCS-Cluster has a much higher sampling efficiency; the percentage of stop readings, which is more than 40 percent in non-Cluster IOCS, is reduced by 60 percent. The Postal Service projects that IOCS-Cluster will obtain twice as much on-premises data, but due to the improvement in sampling efficiency, will not require additional data collection resources.

[10] A reading is "non-stop" when the carrier is actively working in the tested zone (ZIP code and finance number). These include on-street as well on-premises readings. A reading is a stop reading if the employee is not working, or is working but not for the tested zone.

Variances

Variances and CVs are not available at this time. If the IOCS sampling designs were simple random samples, a doubling of the number of non-stop readings would reduce coefficients of variation (CVs) by about 70 percent. IOCS sampling designs are more complex – non-cluster IOCS uses a rotating panel of offices that helps to reduce CVs for year-to-year comparisons, and intra-cluster correlation can inflate variances of cluster sampling estimates.[11] However, it is unlikely that those negative impacts will be large enough to overcome the increase in precision arising from the significant increase in the number of non-stop readings.

Costs on Sundays/Holidays

Accrued costs for city carriers on Sundays and Holidays are obtained by using TACS data. Pending possible further study, the Postal Service proposes to make these costs 100 percent attributable and to use Product Tracking and Reporting (PTR) data to attribute to products. Because the vast majority of parcels delivered on Sundays and Holidays in FY2017 were Parcel Select, this petition shows the effects of attributing all Sunday/Holiday costs to that product for purposes of evaluating and presenting the estimated impact on FY2017 costs.

Carriers Clocking to Other Crafts

Occasionally, carriers are temporarily assigned to act as supervisors, essentially loaned to the supervisor craft. These employees are also included in the IOCS-Cluster

[11] Lohr, S., *Sampling: Design and Analysis*, Pacific Grove: Duxbury, 1999, pp. 138-140.

list of carriers available to be sampled, and data collectors conduct supervisor-mode readings on them. Unsurprisingly, these carriers become supervisors of city delivery carriers, and sometimes of clerks or rural carriers.

Control totals for these readings are also derived from TACS data, since it is possible to identify the hours for employees who clock to a roster designation that is different from their base. The percentage of these TACS hours out of all supervisor hours is used to calculate separate control totals for the carrier-based and non-carrier-based portions of supervisor costs. IOCS-Cluster supervisor tallies provide the data for the carrier-based portion, while non-cluster supervisor tallies provide the distribution key for the non-carrier-based costs.

In principle, the same approach could be used for carriers who clock in as clerks or mailhandlers. However, due partly to the very small number of such readings, this feature has not yet been implemented. The impact on costs would be *de minimis*.

Rationale

The primary objective of this proposal is to replace telephone readings with on-site readings, particularly while carriers are on the premises and handling mail. One benefit is that on-site data collectors can scan barcodes, which can provide valuable feedback at the time of the reading for some of the less-common products, and assist with back-end processing of tallies. An additional benefit is that data collectors may do a better job of recognizing some of the piece markings that are less common and more obscure. Also, data collectors do not have the other duties that may affect and constrain telephone respondents. For example, data collectors may have additional time to find

carriers who are not at their case, who are possibly in the parking area, and who cannot be located immediately.

The opportunity to increase the number of on-site readings is afforded by technological improvements in the collection of time-clock data. Rather than distributing readings widely in time and space as is done by the current IOCS, it is now possible to focus data collection resources to the times and locations when carriers are in the office. With a sufficient number of carriers, six or more in one zone, the proposed IOCS-Cluster system can justify a stand-alone on-site test. Even when there are too few carriers in a zone to justify a stand-alone test, the proposed system nevertheless obtains on-site readings in the morning by synchronizing with CCCS. TACS workhour data are used to appropriately weight the cluster readings to produce cost estimates.

In the afternoon, carriers spend more than 95 percent of their time on the street. The little time spent in the office is mostly for street support activities. Since carriers are typically not handling mail, the benefits of on-site data collection and barcode scanning are correspondingly reduced, and telephone readings can continue to be an adequately reliable (as well as cost-efficient) approach.

The proposed approach obtains sufficient tallies even for small offices. Table 2 below displays the number of carrier non-stop tallies taken in the morning from IOCS-Cluster compared to similar tallies taken in non-cluster IOCS. It demonstrates the success of the approach of synchronizing IOCS-Cluster tests with CCCS tests at offices with few carriers.

Table 2: Comparison of Number of Non-stop Carrier Morning Tallies, by CAG

CAG	Non-Cluster	Cluster
A/B	16,363	22,013
C	9,075	13,989
D	4,261	7,029
E	2,478	7,322
F	1,894	3,957
G	751	1,707
H	319	408
J	42	67
K	9	25
Total	35,192	56,517

In Order 4399 that approved Proposal Five in Docket No. RM2017-9, the Commission suggested an approach for developing route group weighting factors when there were "empty cells", i.e. no tallies within the combination of route group (letter and SPR) and carrier group (full time; part-time/transitional). This approach has been implemented here. Specifically, if there are any "empty cells" for a specific CAG, costs and tallies are first grouped with costs and tallies of smaller CAGs that do not have empty cells. If no smaller CAG is available, then data are grouped with larger CAGs.

Impact

As shown in Table 3, IOCS-Cluster results in a significant increase in the percentage of direct tallies where the carrier is handling a mailpiece, and decreases in tallies for support and administrative activities (no mailpiece), training and mixed mail.

Table 3: IOCS-Cluster Impact on Costs by Tally Category

Tally Category	Non-cluster	Cluster	%change
Direct (single mailpiece)	$792,373	$1,087,981	37%
Mixed	$396,399	$326,233	-18%
Support/Admin	$683,702	$451,022	-34%
Street	$6,216,998	$6,230,972	0%
Training	$46,448	$39,711	-15%
Total	$8,135,919	$8,135,919	0%

The increases in the relative proportion of direct tallies may be because on-site data collectors are not as restricted in their time availability as carrier supervisors who have primary duties in addition to their role as telephone respondents.

There is also an increase in tallies in the parking area, as shown in Table 4. In particular, the increase in the number and percentage of direct tallies is very significant. These increases may be due to the additional time required for telephone respondents to obtain a parcel from a carrier in the parking area and return it to them after the reading.

Table 4: IOCS-Cluster Impact on Parking Area Tallies

Parking Tally Category	Non-cluster	Cluster	%change
Number Direct Tallies	120	899	649%
Mixed Mail	1,377	2,606	89%
Subtotal Handling Tallies	1,497	3,505	134%
Total Parking Area Tallies	3,495	5,729	64%
Percentage Direct out of Handling Tallies	8%	26%	220%

The increase in parking area direct tallies may make it possible to distribute mixed mail tallies separately from in-facility. This has the potential to improve mixed mail distribution, since these two locations have different activities (e.g. casing compared to loading the vehicle) and handle different mail categories. This prospect

could be further enhanced by recording information that is more detailed than the current non-cluster IOCS when a carrier is handling mixed mail, such as a hamper, details that current telephone respondents may not be able to provide reliably.

The effect of this proposal on supervisor costs is developed in workbook SupervisorCostImpact.xlsx, provided (along with other public material related to this Proposal) in USPS-RM2018-5/1. There is an increase of costs associated with supervising city carriers of 9.1 percent. This effect contributes to a slight increase in the piggyback factors on city carriers, which are developed in workbook FY17.PB CityRevisedCluster.xlsx. For most products, the piggyback ratio for all volume variable costs increased by approximately 0.34 percent, and this has been incorporated in the product cost impacts below.

Table 5 below compares the costs by product for cost segments 6 and 7 and for total CRA costs. The revised costs are based on data from the national implementation of IOCS-Cluster that is running in parallel with non-cluster IOCS. The Office and Street columns in the table compare dollar-weighted tallies for FY2017 Q4 and FY2018 Q1 from the proposed IOCS-Cluster methodology with existing CRA methodology. These percentage differences are applied to the FY2017 CRA to project how unit costs would have changed under the proposed methodology. More detail regarding the impact on competitive products, as well as other nonpublic material related to this Proposal, can be found in USPS-FY2018-5/NP1, provided under seal.

The pilot data indicate some significant shifts in product costs. For example, costs for First-Class letters decrease, while costs increase for a number of products, including parcel-shaped products, carrier route bundled products, Periodicals and

International Mail. The shifts in costs are most likely due to the benefits of having on-site data collectors rather than using telephone respondents.

Table 5: IOCS-Cluster Sampling on Product Unit Costs

	CLASS, SUBCLASS, OR SPECIAL SERVICE	CRA Class	OFFICE AND STREET WITH PIGGYBACKS, No Cluster	OFFICE AND STREET WITH PIGGYBACKS, IOCSClusterV2	% CHANGE OFFICE AND STREET COSTS	FY17 VOL VAR UNIT COST, FY17 ACR	FY17 UNIT COST WITH IOCSClusterV2	% CHANGE	DIFF UNIT COST
	COLUMN NUMBER		(8)	(9)	(13)	(14)	(15)	(16)	(17)
	UNITS							%	
1	**MARKET DOMINANT**								
2	**First-Class Mail**								
3	Single-Piece Letters	3	817,236	671,148	-18%	$ 0.287	$ 0.270	-5.7%	$ (0.016)
4	Single-Piece Cards	4	35,606	32,138	-10%	$ 0.316	$ 0.306	-3.1%	$ (0.010)
5	Presort Letters	8	687,197	619,572	-10%	$ 0.118	$ 0.114	-3.2%	$ (0.004)
6	Presort Cards	9	29,185	34,300	18%	$ 0.075	$ 0.079	6.2%	$ 0.005
7	Flats	0	138,910	140,550	1%	$ 1.055	$ 1.058	0.2%	$ 0.002
8	Parcels	19	14,010	17,042	22%	$ 2.502	$ 2.590	3.5%	$ 0.087
7	**Total First-Class Mail**	80	1,722,144	1,514,750	-12%	$ 0.200	$ 0.193	-3.6%	$ (0.007)
8	**USPS Marketing Mail**								
11	High Density and Sat Letters	21	135,284	151,716	12%	$ 0.072	$ 0.076	6.3%	$ 0.005
12	High Density and Sat Flats/Parc	22	339,937	375,967	11%	$ 0.110	$ 0.116	5.7%	$ 0.006
13	Every Door Direct Mail-Retail	24	18,871	21,095	12%	$ 0.066	$ 0.072	9.7%	$ 0.006
14	Carrier Route	23	410,167	456,803	11%	$ 0.209	$ 0.220	5.5%	$ 0.012
15	Letters	25	882,440	892,506	1%	$ 0.102	$ 0.102	0.4%	$ 0.000
16	Flats	26	411,899	364,309	-12%	$ 0.518	$ 0.496	-4.2%	$ (0.022)
17	Parcels	27	8,250	7,561	-8%	$ 1.793	$ 1.755	-2.1%	$ (0.037)
18	**Total USPS Marketing Mail**	81	2,206,847	2,269,958	3%	$ 0.137	$ 0.139	1.2%	$ 0.002
22	**Total Periodicals**	82	278,824	325,916	17%	$ 0.373	$ 0.391	4.9%	$ 0.018
23	**Package Services**								
24	Bound Printed Matter Flats	42	13,826	23,717	72%	$ 0.500	$ 0.568	13.7%	$ 0.068
25	Bound Printed Matter Parcels	43	40,340	55,973	39%	$ 0.971	$ 1.075	10.7%	$ 0.104
26	Media/Library Mail	44	13,216	15,459	17%	$ 4.600	$ 4.656	1.2%	$ 0.056
27	**Total Package Services**	83	67,383	95,149	41%	$ 1.244	$ 1.327	6.7%	$ 0.083
28	**US Postal Service**	85	30,123	25,887	-14%				
29	**Free Mail**	86	1,879	2,738	46%	$ 0.910	$ 0.950	4.4%	$ 0.040
30	**Total Domestic MD Mail**	90	4,307,200	4,234,398	-2%				
31	**Ancillary Services**								
32	Certified Mail	51	78,708	86,421	10%	$ 2.759	$ 2.842	3.0%	$ 0.083
33	COD	52	234	261	12%	$ 6.642	$ 6.764	1.9%	$ 0.123
34	Insurance	54	1,456	1,769	21%	$ 3.173	$ 3.204	1.0%	$ 0.031
35	Registered Mail	55	1,022	776	-24%	$ 11.029	$ 10.778	-2.3%	$ (0.251)
38	Other Ancillary Services	58	41,921	39,701	-5%				
42	**Total Domestic MD Svcs**	91	123,340	128,927	5%				
43	**Total Domestic MD Mail/Svcs**	92	4,430,540	4,363,325	-2%				
52	**Total Domestic Cmp Mail/Svcs**	192	813,998	1,132,533	39%	$ 2.430	$ 2.548	4.8%	$ 0.117
53	**INTERNATIONAL**	185	79,785	86,334	8%				
54	**Total Volume Variable**	198	5,324,323	5,582,192	5%				
55	**Other**	199							
56	**Grand Total**	200							

Appendix A: In-Office Cost System: Cluster (IOCS-Cluster) Statistical Documentation

Overview

The In-Office Cost System (IOCS)-Cluster subsystem is a continuous, ongoing statistical sampling system to estimate the costs of various activities performed by city carriers while working on the premises. Although the Postal Accounting system tracks costs for various categories of employees, it does not identify labor costs by product because carriers are simultaneously processing more than one product. IOCS-Cluster is designed to supplement the accounting system data by sampling carriers at randomly selected points in time throughout the year. When sampling a carrier, the data collector records the activity of that carrier into a laptop computer using the IOCS Computerized On-Site Data Entry System (CODES) software.

These sample data, in combination with data from the accounting system, the Delivery and Operations System (DOIS), and the Time and Attendance Collection System (TACS), are used to provide detailed estimates of attributable costs for various activities.

Statistical Study Design

The universe under study in IOCS-Cluster consists of all the work time during a fiscal year for all city carriers. That time is partitioned into two sections for sampling.

Morning: Carriers spend the bulk of their time in the office in the morning, before 11:00. Work activities during this time are evaluated by a multi-stage clustered design that samples a cluster of carriers assigned to a specific

zone[12]. Data collectors who are on-site at the delivery facility conduct IOCS readings.

Afternoon: After 11:00, carriers are mostly on the street rather than in the office handling mail. Work status during this time is evaluated by a multi-stage clustered design that samples carriers within a district during a specific one-hour time block. A data collector calls telephone respondents at delivery offices for information about specific carriers that have been randomly selected from across the district.

The carrier data that is collected by the two sampling modes above are post-stratified using TACS workhour data. Specifically, TACS workhours are used to control estimates by:

Craft group: full-time (roster designation 13), and part-time/transitional (roster designations 33, 43, 63, 83, and 84). In addition, TACS is used to identify workhours for carriers clocking in as a supervisor.

CAG group: workhours are assigned to finance numbers, which are assigned a Cost Ascertainment Group (CAG) that reflects the average associated revenue. Some individual CAGS are grouped together, e.g. CAGs H, J, K and L form the CAG H-L group.

Route group: regular letter routes (IOCS route types 73 to 83, and 99) and Special Purpose Routes (SPR, IOCS route types 86-98).

[12] Zone is defined by both ZIP Code and finance number.

Morning tests

The primary data collection for IOCS-Cluster is obtained from data collectors who conduct tests at a delivery facility while on-site.

First Stage Sample (Zone/day)

The first-stage sampling unit is a zone/facility-day. The frame is the set of delivery zones and facilities with at least one city carrier route.[13] Zones are selected using proportional-to-size (PPS) sampling. There are two sampling modes: large zones have six or more city carrier routes, while small zones have five or fewer routes. At large zones, there are a sufficiently large number of carriers that it is cost-effective for a data collector to conduct a stand-alone IOCS-Cluster test. At small zones there are too few carriers to justify a stand-alone test. For those zones, IOCS-Cluster is synchronized with the City Carrier Cost System (CCCS), since a data collector is already scheduled to be on-site for the CCCS test.

a. Zone selection for large zones

For the large zone mode, the frame consists of all delivery zones that have at least six city carrier routes at a facility. The number of workhours recorded in DOIS in the preceding four weeks is used to order the zones, and a systematic random sample is drawn in order to select zones in proportion to the number of hours.

[13] The facility is represented by the finance number and DOIS delivery facility ID.

b. Zone selection for small zones

For the small zone mode, the first-stage zone/facility-day is determined from CCCS. Whenever CCCS selects a route that is part of a zone with five or fewer routes, an IOCS-Cluster test is also scheduled for that zone. Since CCCS selects routes randomly, this is equivalent to selecting zones in proportion to the number of routes. Every CCCS test scheduled for a route in a small zone will be combined with a corresponding IOCS-Cluster test.

c. Day selection

Possible delivery dates (Mondays through Saturdays, excluding holidays) are randomized and systematically assigned to selected zones to determine the zone/facility-days. These are the first-stage sampling units and define the cluster of carriers that are eligible for sampling in the second stage.

Second Stage Sample (Carrier)

The second-stage sampling unit is the individual carrier. Before the test begins, the data collector identifies all carriers who will be working and assigned to the tested zone for any part of the morning.

For large-zone tests, the CODES software randomly selects six carriers from the set of all available carriers.

For small-zone tests, if there are six or fewer carriers working that day, then all are included in the sampling. Otherwise the CODES software randomly selects a subsample of six.

Third Stage Sample (Time)

The third-stage sampling unit is the moment in time of the selected carriers.

For large-zone tests, the data collector conducts a reading every five minutes.

For small-zone tests, the data collector conducts a reading every 15 minutes.

Data collectors conduct readings from the time carriers in the office begin work until 11:00. If all sampled carriers have left for the street before 11:00, the data collector may pre-record street readings up to the 11:00 ending time of the test, after confirming with the supervisor that carriers will not be returning to the office before 11:00. This resolves the inefficiency of a data collector staying in the facility until 11:00 only to record street readings every 5 or 15 minutes.

Estimation

The weights for each IOCS-Cluster record are developed using census data from DOIS and TACS for the tested office and the time of day in which the reading occurred, in addition to the national level accrued quarterly payroll data for carriers.

Cost controls and weighting factors are calculated separately for two subgroups of carriers: a) full-time regular (roster designation 13) and b) part-time / transitional carriers including city carrier assistants (CCAs) (all other carrier roster designations). Payroll systems provide the total direct labor cost for each subgroup. TACS data allocates each of these subgroup's costs to route groups (letter routes or special purpose routes) and time of day by CAG group.

IOCS-Cluster develops cost estimates for the products handled and activities of carriers working on-premises, as well as a cost total for carriers working on the street. Cost weights are calculated as:

Let

i	index to test, within stratum;
z	zone stratum (large, small);
j	craft subgroup (full-time, part-time/transitional);
k	CAG group;
l	route group (regular, SPR);
n	number of non-stop carrier tallies;
H^{Samp}	DOIS hours for zone used when selecting samples
H^{Actl}	Actual DOIS hours for sampled zone during quarter
H^{Pop}	Actual DOIS hours for all zones in the frame
H	TACS hours (H_{jkl} is hours by craft group, CAG group and route group);
RW	Reading weight, for individual samples;
C	cost from accounting (C_{jk} is cost by craft group and CAG);
CW	cost weight assigned to each non-stop reading;

First, we weight the readings in each test by the inverse of the sampling probability, and proportionately with actual hours.

$$RW1_{iz} = \left(\frac{1}{n_{iz}}\right) * \left(\frac{\overline{H_z{}^{Samp}}}{H_{iz}{}^{Samp}}\right) * H_{iz}{}^{Actl}$$

Next, we adjust the weights to reflect the differences in sampling frequency for the different strata, i.e., the intensity of sampling of the strata population.

$$RW2_{iz} = RW1_{iz} * \left(\frac{\sum_i H_{iz}}{\sum_{iz} H_{iz}}\right) * \left(\frac{H^{Pop}}{H_z^{Pop}}\right)$$

We obtain the control total costs for post-stratification using TACS hours by craft group, CAG group and route group applied to total direct labor costs from accounting systems.

$$C_{jkl} = \left(\frac{H_{jkl}}{H_l}\right) * C_{jk}$$

Finally, we convert the tally reading weights into cost weights. This is done by each combination of craft group and CAG group separately.

$$CW_{izjkl} = \frac{RW2_{izjkl}}{\sum_l RW2_{izjkl}} * C_{jkl}$$

Afternoon tests:

The first-stage sampling unit is the district. Districts are selected in proportion to the number of carrier DOIS hours.

The second-stage sampling unit is the one-hour time block. Time blocks are selected from 11:00 to 18:00 with equal weight.[14]

Thirty carriers are randomly selected from IOCS panel offices within the district. The list of carriers is sorted by office. A data collector calls telephone respondents at each office to conduct readings on their sampled carriers.

Estimation of tally cost weights in the afternoon is given by:

$$CW_{ijkl}{}^{aft} = \frac{\left(\frac{H_{jkl}^{aft}}{H_{jk}}\right) * C_{jk}}{n_{jkl}{}^{aft}} = \frac{C_{jkl}{}^{aft}}{n_{jkl}{}^{aft}}$$

[14] Beginning in FY2018 Q3, one-hour tests are also conducted from 18:00 to 19:00.

where

i	index to test, within stratum;
j	craft subgroup (full-time, part-time/transitional);
k	CAG group;
l	route group (regular, SPR);
H	TACS hours (H^{aft} are hours in afternoon);
C	Costs from accounting (C_{jk} is cost by craft group and CAG);
n^{aft}	number of non-stop afternoon readings;
CW^{aft}	Cost weight in afternoon per tally.

Carriers Clocking as Supervisors

For the small number of carriers who are acting as a supervisor, detailed TACS data summarizing hours by employees' base craft group, as well as by their clocked craft group, are used to develop the cost control totals. The control total cost is distributed to all readings equally within the morning or afternoon strata.

Let

(c2s)	carrier acting as supervisor;
(s\c)	supervisors that are not carriers acting as supervisors;
j	strata (morning, afternoon);
k	CAG group;
n	number of non-stop tallies of carriers acting as supervisors;
H_s	TACS Hours for supervisors;
$H_{(c2s)}$	TACS hours for carriers acting as supervisors;
C_s	Costs from accounting for supervisors.
$C_{(c2s)}$	Costs for carriers acting as supervisors
$C_{(s\c)}$	Costs for supervisors who are not originally carriers

The cost associated with carriers acting as supervisors is calculated from TACS and accounting costs as:

$$C_{(c2s)} = \left(\frac{\sum_j H_{j(c2s)}}{H_s} \right) * \ C_s$$

The cost weight for IOCS-cluster tallies of carriers acting as supervisors within each time strata is given by:

$$CW_{j(c2s)} = \frac{C_{j(c2s)}}{n_j}$$

Costs for supervisors whose base roster designation is not a carrier continue to be estimated from non-cluster IOCS. However, the non-cluster supervisor tallies are applied only to the cost

$$C_{(s\backslash c)} = C_s - C_{(c2s)}$$

rather than to total supervisor cost C_s.

There are too few carriers who clock as clerks or mailhandlers to affect cost estimation significantly. Similarly, there are too few clerks, mailhandlers or supervisors who clock as carriers to significantly affect cost estimation.

Sunday/Holiday

Carrier labor on Sundays and Holidays is focused almost exclusively on parcel delivery on the street. IOCS-Cluster does not sample carriers on Sundays and Holidays; rather costs are based on TACS clocked workhours, and distributed to products based on parcel barcode scans.